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9 FINAL REPORT,

LEVEL II

ADA078345

6 DESIGN AND FEASIBILITY DEMONSTRATION
OF A DEPLOYMENT SYSTEM FOR A
ROCKET LAUNCHED BUOY

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1.0 INTRODUCTION

In 1978, HYCOR submitted a proposal

In November 1978 a proposal was submitted to the Naval Research Laboratory, to design and demonstrate a technique for ~~the~~ deployment of an electronic buoy payload from a rocket launched vehicle. In view of HYCOR's participation in the NATO Sea Gnat Program, it was proposed to ~~utilize~~ use the existing Sea Gnat Rocket Motor, Sea Gnat Fuze, and ~~other~~ related hardware and technologies to conduct a low cost, high confidence development program. Deployment system requirements are given in the following section.

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The program was successfully completed in March 1979 with the demonstration of satisfactory deployments at Blossom Point, Maryland, and the CBD facility of the Naval Research Laboratory. Live simulated and operational payloads were used ~~utilized~~ in ~~the CBD~~ tests with an active onboard VHF transmitter providing inflight data and data on the descent and entry of the buoy into the water following deployment. (cont/on p. 12)

2.0 SYSTEM REQUIREMENTS

The deployment system requirements are as follows:

a) Deployment Velocity - Separation rate of approximately 40 ft/sec.

b) Weight - Not specified

c) Length - Not specified

d) Interfaces - Mechanically interface with NOS Indian Head provided rocket motor (DWG NO. ET-SK1210); Electrically interface with both NOS Rocket Motor and HDL Supplied Sea Gnat digital fuze and S&A. Canister to be 5.125 in. diameter and compatible with MK 36 launching system.

3.0 DEPLOYMENT SYSTEM DESCRIPTION

The following sections describe the component parts of the buoy deployment system. Figure 1 illustrates the overall layout of the assembled cartridge with more detailed descriptions and illustrations provided in the following sections.

3.1 Outer Case/Cap Retention

The outer case housing the electronic payload consists of a 5.125 in. diameter fiberglass tube as shown in Figure 2. This case is used in both the MK 182 Cartridge and in Sea Gnat Cartridges. As shown in the detail AA of Figure 2 a cammed slot was machined in the case to retain a standard Sonobuoy Cap P/N 363AS100. The wall thickness of 0.10 in. was selected to provide a retention force of approximately 200 lbs. The case is bonded to the deployment charge compartment as described in Section 3.3.

3.2 Deployment Piston

After early experiments with the standard Sonobuoy deployment piston it was decided to utilize a stronger, thicker piston to reduce shock to the electronic payload and to eliminate cocking of the piston. Figure 3 illustrates the piston used in the deployment system. It consists of a simple right circular cylinder of Lexan backed up with a caplug obturating cup akin to those used in the MK 171 cartridges. This piston resides under the payload and is propelled forward by the action of the deployment charge initiation.

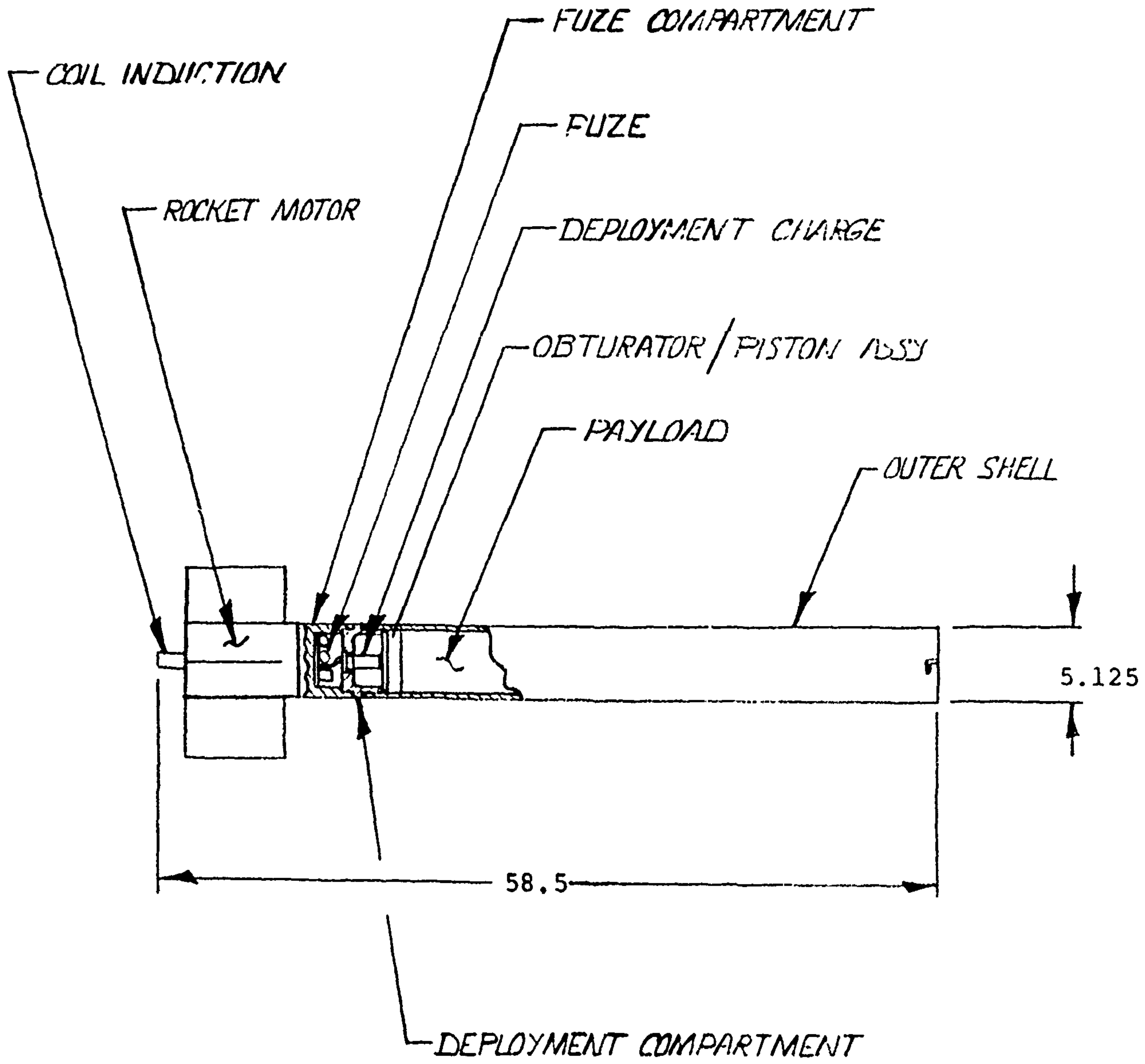

Figure 1 VEHICLE LAYOUT

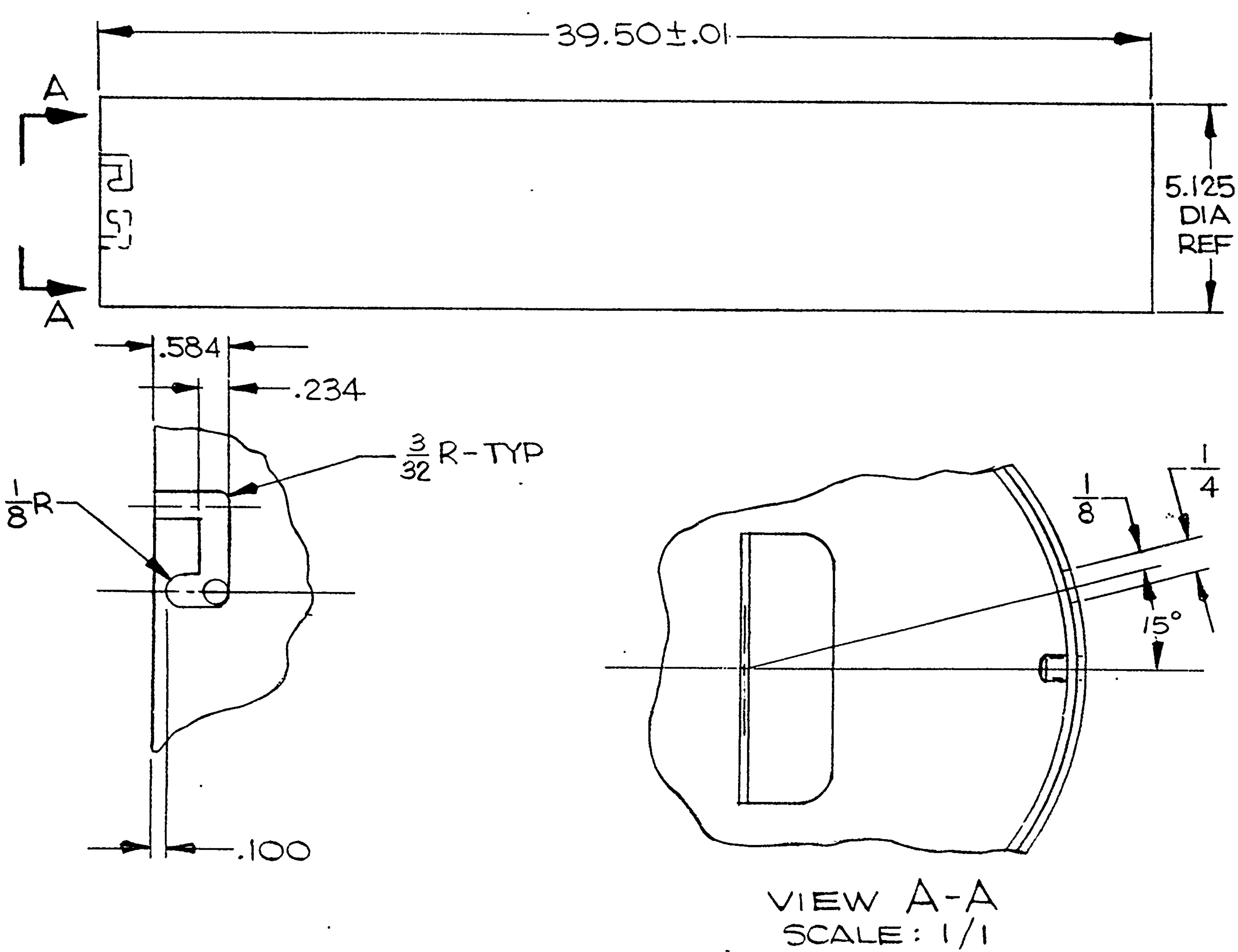

Figure 2 OUTER CASE

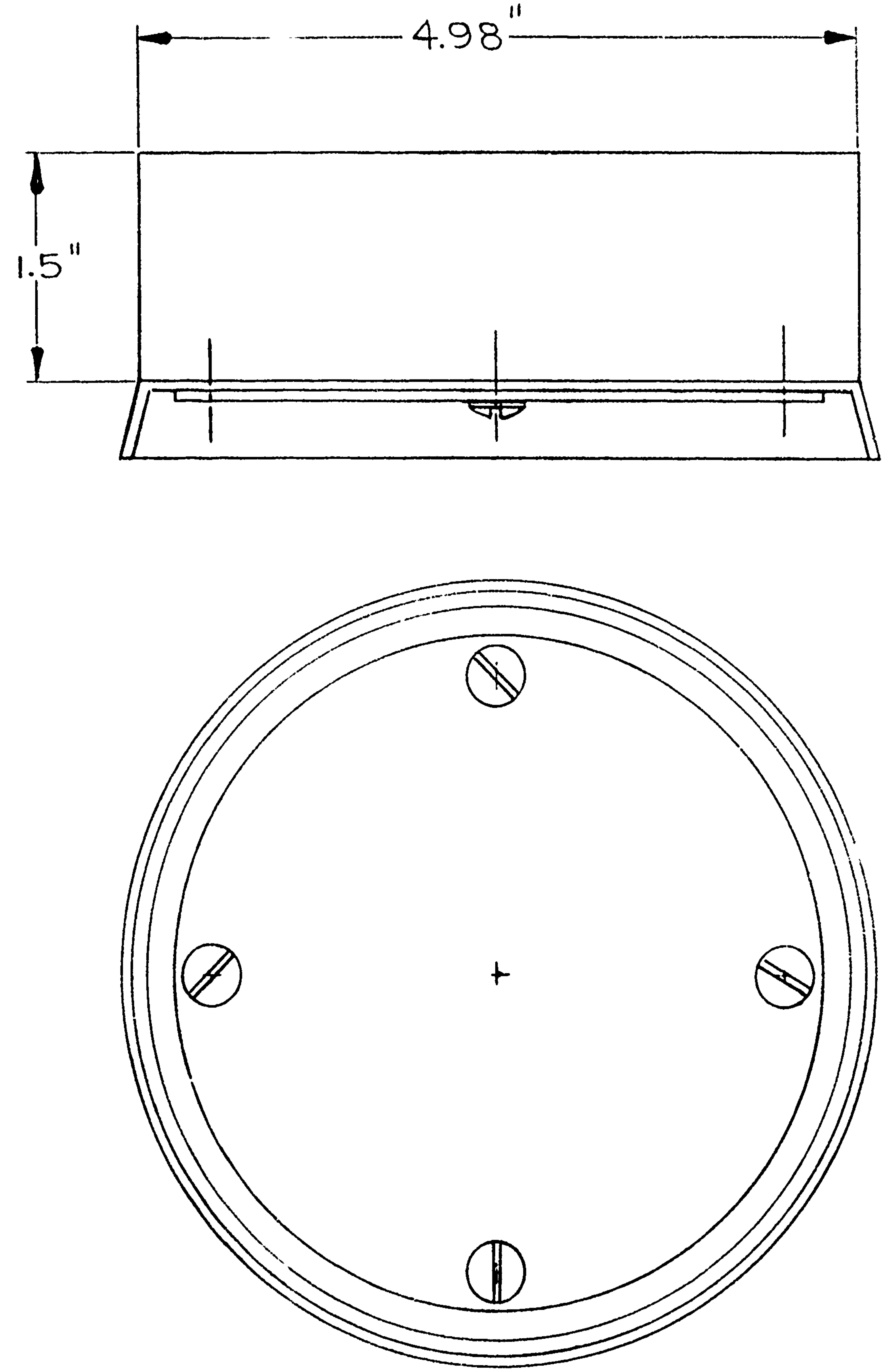

Figure 3 DEPLOYMENT PISTON

3.3 Deployment Charge Compartment

The design approach selected in this program was to divide the system into three major components, the payload housing, the deployment charge compartment and the fuze compartment. This permitted subscale testing to proceed in parallel rather than as a series development.

The deployment charge compartment houses the deployment charge and contains the initial high pressures generated by the initiation of the deployment charge. The outer case is bonded to the forward land of the compartment and the fuze compartment is bonded and pinned to its rear. Figure 4 illustrates this aluminum housing. The center tapped hole will receive the deployment charge assembly after insertion of the deployment piston.

3.4 Deployment Charge

Figure 5 presents the deployment charge assembly consisting of a plug, case, squib housing, head and 9 grains of smokeless powder. The MK 17 Mod 0 squib is initiated by the Sea Gnat Fuze output which ignites the powder thereby driving the deployment piston forward deploying the payload from the canister.

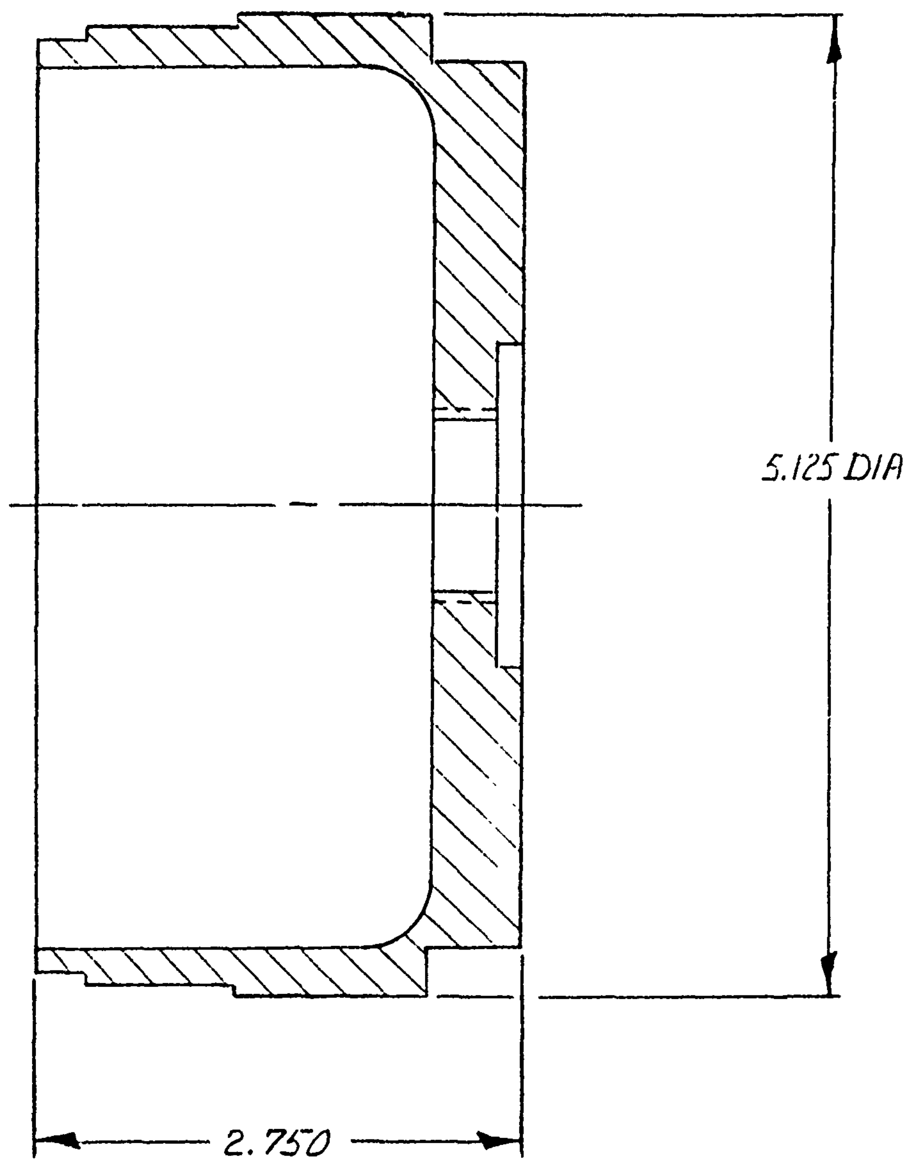

Figure 4 DEPLOYMENT COMPARTMENT

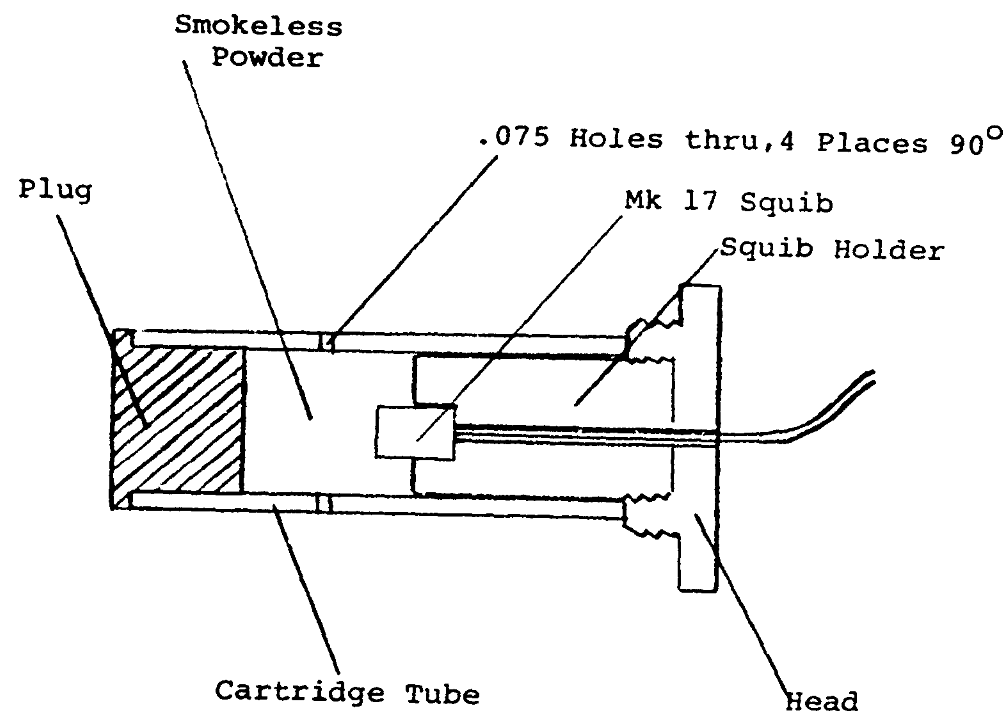

Figure 5 DEPLOYMENT CHARGE ASSEMBLY

3.5 Fuze Compartment

Figure 6 illustrates the fuze compartment. The same mechanical interface employed in the Sea Gnat Program both for the fuze board and mating with the rocket motor is incorporated in this compartment. Figure 7 presents the electrical interconnections used on this program. The S&A in the buoy deployment system functions only as a switching device to direct current to the MK 17 squib rather than as an explosive initiator as in the Sea Gnat Program. Mating with the rocket motor is achieved using the normal lock wire technique.

4.0 FEASIBILITY DEMONSTRATIONS

The first field test of the deployment system was conducted on 1 March 1979 at Blossom Pt. Maryland with an inert simulated payload. The fuze setting was 6 seconds and the deployment was satisfactory.

The second tests occurred on 2 March 1979 at CBD over water with simulated electronic payloads. Fuze settings were 6 seconds and 2 seconds for the two tests conducted. Payload deployment was satisfactory in both tests.

Final deployment tests were conducted at CBD over water with the final electronic payload on 15 May 1979. These tests were conducted with an active VHF transmitter onboard to monitor flight environments. Again, payload deployment was satisfactory with maximum g-loading in the range of 50 to 60 g's maximum.

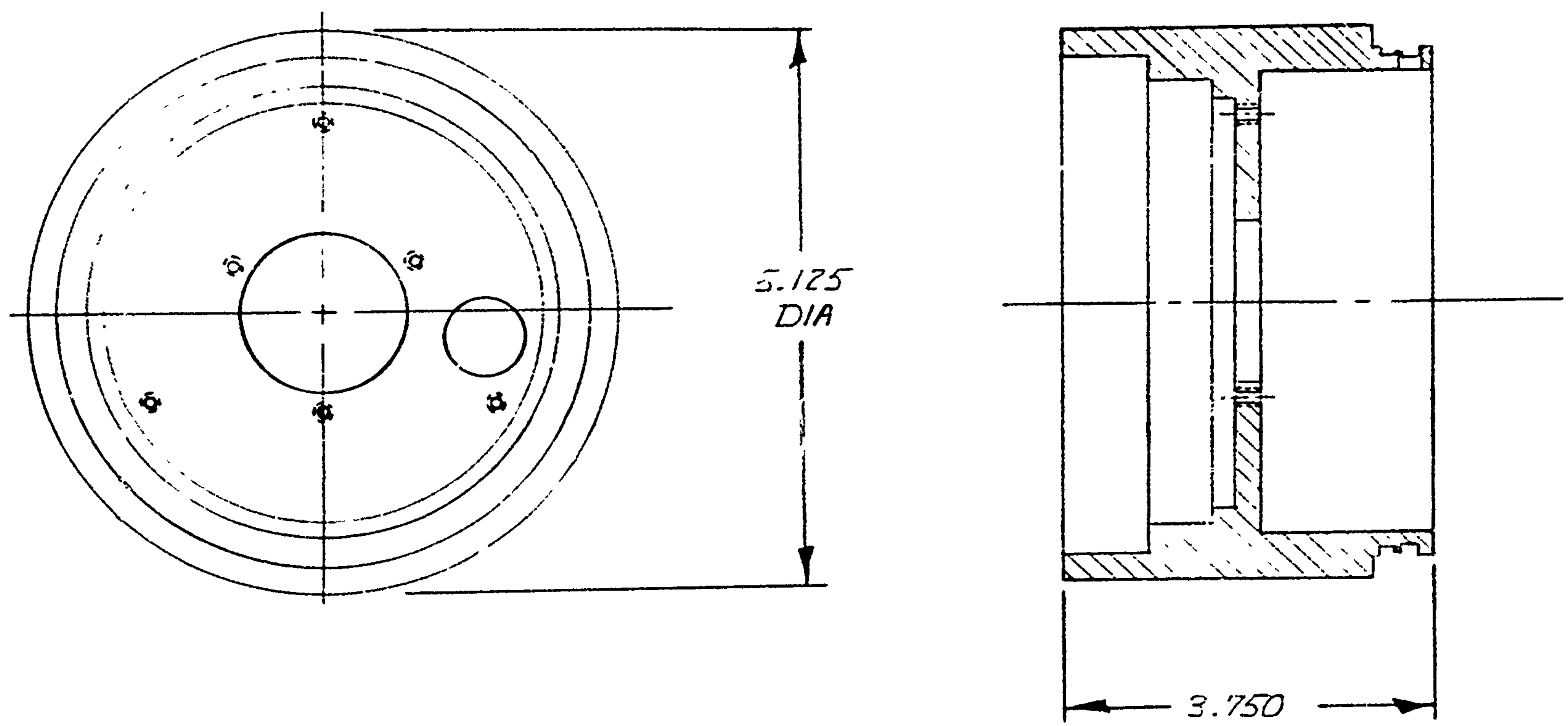

Figure 6 FUZE COMPARTMENT

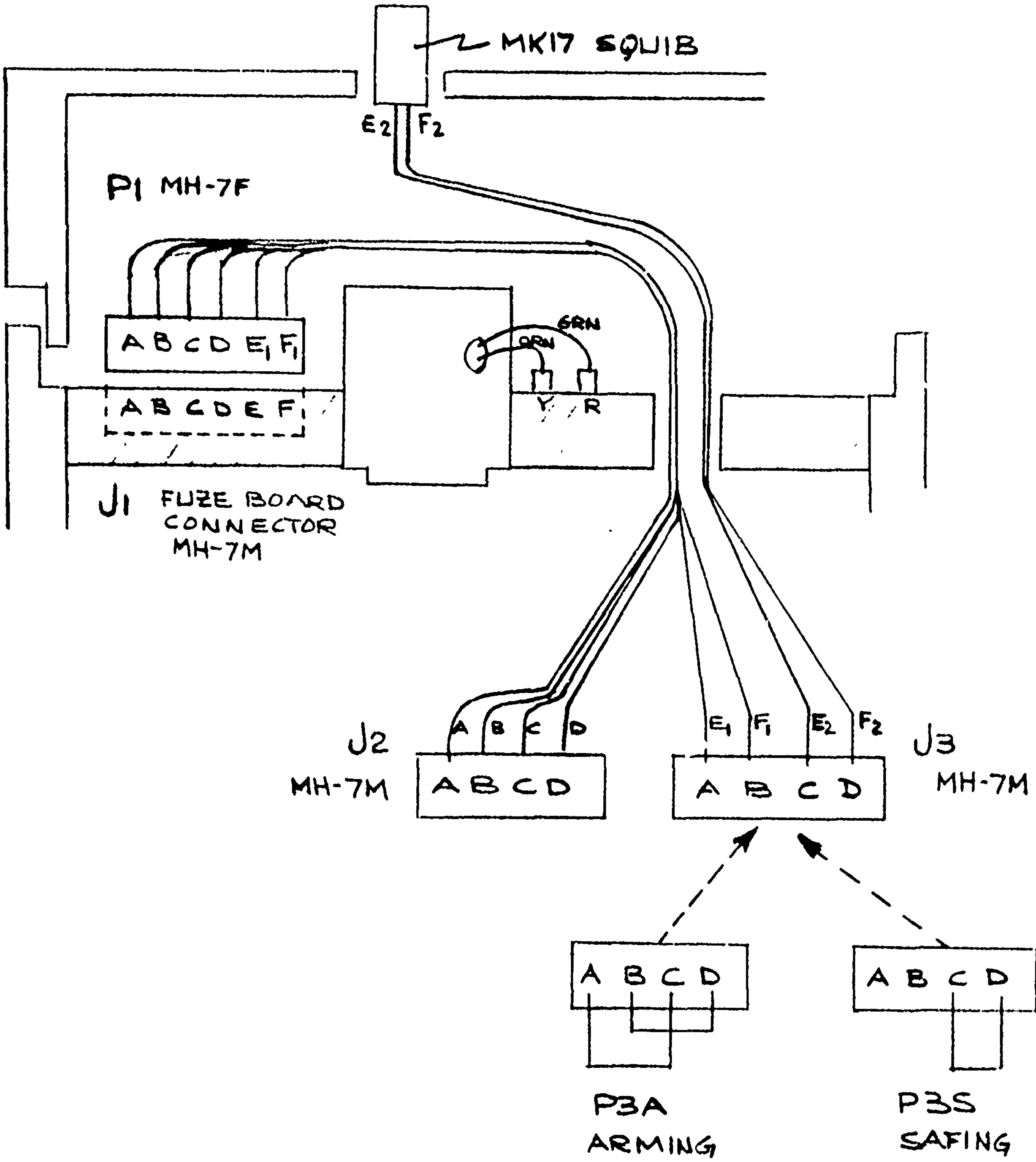

Figure 7 WIRING SCHEMATIC

5.0 SUMMARY AND CONCLUSION

cont 5, p 1

The ~~deployment~~ system described has been demonstrated to reliably deploy an electronic payload with dynamic loads during deployment no more severe than those experienced on water entry. The system developed is not optimized for weight or cost but is judged to be effective and reliable for its intended purpose. ~~The system described~~ It is not limited to the electronic buoy for which it was developed but is applicable to any quasi cylindrical payload to be deployed following a rocket launch from the MK 36 launching system.